FINAL REPORT
AOARD 05-4029 (?)

Microstructural Evolution of Commercial-Purity Ti and Superplasticity of Ti-6Al-4V alloy Processed by Equal Channel Angular Extrusion

Prof. Dong H. Shin
Department of Metallurgy and Materials Science
Hanyang University, Ansan
Kyunggi-Do 425-791
Korea

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
08 DEC 2006	**Final Report (Technical)**	**20-12-2004 to 06-12-2006**

4. TITLE AND SUBTITLE
Microstructural evolution of commercial-purity Ti and superplasticity of Ti-6Al-4V alloy processed by equal-channel angular extrusion

5a. CONTRACT NUMBER
FA520905P0175

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Dong Shin

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Hanyang University,Kyunggi-Do,Ansan ,Korea (South),KE,425791

8. PERFORMING ORGANIZATION REPORT NUMBER
AOARD-054029

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
The US Resarch Labolatory, AOARD/AFOSR, Unit 45002, APO, AP, 96337-5002

10. SPONSOR/MONITOR'S ACRONYM(S)
AOARD/AFOSR

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

This project focused on deformation processing, microstructural development, and mechanical properties of Ti and Ti-6Al-4V alloys. Specific tasks included: (1) Study superplastic deformation of a Ti-6Al-4V alloy that have been processed by equal channel angular extrusion and relate the deformation mechanism to the enhancement of superplasticity, and (2) Examine the effect of strain path for Ti fabricated by equal channel angular extrusion and uniaxial compression, with a special focus on the improved mechanical properties of the deformed Ti. As a part of the report, two papers were published in Materials Science and Engineering A (vol.A410-411, 2005, 156-159) and Metallurgical and Materials Transactions A (vol.37, 2006, 381-391). The work was begun under AOARD 034023, ?Microstructure development of ultrafine grained Ti and superplasticity of Ti-6Al-4V alloy.? Most of that effort was devoted to Ti-6Al-4V alloy. Much progress has been made over the more than two years of effort. We propose to complete our studies by studying, in detail, deformation mechanisms for the enhanced superplasticity in the ultrafine grained Ti-6Al-4V alloy with a special focus on the role of non-equilibrium grain boundaries.

15. SUBJECT TERMS
Titanium Alloy, Materials Processing, Metals and Alloys

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**		**3**	

Overview

This project focused on deformation processing, microstructural development, and mechanical properties of Ti and Ti-6Al-4V alloys. Specific tasks included: (1) Study superplastic deformation of a Ti-6Al-4V alloy that have been processed by equal channel angular extrusion and relate the deformation mechanism to the enhancement of superplasticity, and (2) Examine the effect of strain path for Ti fabricated by equal channel angular extrusion and uniaxial compression, with a special focus on the improved mechanical properties of the deformed Ti.

The following report is composed of two papers those were published in Materials Science and Engineering A (vol.A410-411, 2005, 156-159) and Metallurgical and Materials Transactions A (vol.37, 2006, 381-391). In addition to colleagues at Hanyang University, collaborators were Prof. Chong Soo Lee of POSTECH (who was also under contract to AOARD) and Dr. Lee Semiatin of the Materials and Manufacturing Directorate, Air Force Research Laboratory, Wright-Patterson Air Force Base.

The work was begun under AOARD 034023, “Microstructure development of ultrafine grained Ti and superplasticity of Ti-6Al-4V alloy.” Most of that effort was devoted to Ti-6Al-4V alloy. Much progress has been made over the more than two years of effort. We propose to complete our studies by studying, in detail, deformation mechanisms for the enhanced superplasticity in the ultrafine grained Ti-6Al-4V alloy with a special focus on the role of non-equilibrium grain boundaries.